No. of Printed Pages : 2

BME-029

01388

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

Term-End Examination

December, 2010

BME-029 : ROBOTICS

Time : 3 hours *Maximum Marks : 70*

Note : *Assume suitable missing data. Attempt* ***any five*** *questions. Scientific calculator is allowed.*

1. (a) What are the four D's of robotics? What are the "Laws of Robotics. " 7

   (b) Discuss the anatomy of a robot. 7

2. (a) Why DC motors are commonly used in robotics ? What are difficulties of using an AC motor? 7

   (b) In what type of working are robots used? What are the safety issues in robotics ? 7

3. (a) Define Degree of freedom in detail. Explain Euler angles representation. 7

   (b) Explain the Denavit - Hartenberg representation with its importance. 7

4. Find out the D - H parameters of three link planar arm as shown in Figure - 1 **14**

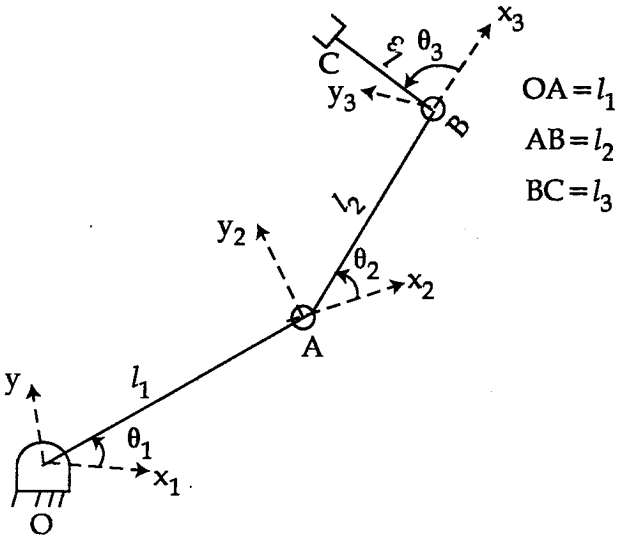

Figure - 1 : Three - link planar Arm

5. Derive the dynamic equations of motion of 3 link planar manipulator as shown in Figure - 1 based on Euler-Lagrange equations. **14**

6. (a) What is difference between path & trajectory? What is the advantage of joint space scheme? **7**

   (b) How one can avoid the use of higher order polynomials while several points are specified? **7**

7. Explain PID control with the help of a figure for a trajectory - following control system. **14**